

08313350 Rito de los Frijoles in Bandelier National Monument,
NM

RIO GRANDE BASIN

Part 8 - 1977

Regular Station

Flood of July 5, 1977

Indirect Measurement
5-Section Slope-area

Discharge 654 ft³/s

Gage height: 5.02 ft (highwater mark
inside of well)

by

New Mexico District

Water Resources Division, U.S. Geological Survey

Santa Fe, New Mexico

For Administrative Use Only

MEMORANDUM OF REVIEW

08313350 Rito de los Frijoles in Bandelier National Monument,
NM

Flood of July 5, 1977

A peak discharge of $694 \text{ ft}^3/\text{s}$ was obtained by using a 5-section slope-area reach near a re-established gaging station.

The instrument man and notekeeper had no previous experience in this particular type of survey which resulted in minor deviations from recommended procedures of recording data. Notes are sufficiently complete and accuracy of measurement is not affected by procedures used. A survey of high-water marks made at the gage site shows higher stage than mark in well.

The analysis by Mr. Thomas covers the essential details of the survey.

There was evidently little choice in the reach used. The roughness coefficients as selected in the field seem reasonable but are difficult to evaluate.

Use $654 \text{ ft}^3/\text{s}$ and rate it no better than fair. The roughness coefficients are uncertain, the lowest sub-reach discharge is $457 \text{ ft}^3/\text{s}$ and the highest is $944 \text{ ft}^3/\text{s}$. The measurement plots low in discharge with respect to a 3-section slope-area for flood of July 27, 1977. Ten color pictures taken Aug. 3, 1977 at gage site show the channel partly choked with logs and other debris. A check board and logs were removed from throat of flume on July 7, 1977.

The reviewer has not seen site.

L. J. REILAND
District Reviewer
8/23/77

RIO GRANDE BASIN

Part 8 - 1977

Regular Station

Flood of July 5, 1977

TYPE OF MEASUREMENT.--5-Section Slope-Area.

LOCATION OF SITE.--The slope-area site is about 800 ft upstream from the gaging station.

SURVEY OF SITE.--The site was selected and highwater profiles were surveyed on July 7, 1977 by R. P. Thomas, J. Simitz and K. Newton. Cross-sections were surveyed on July 12, 1977 by Thomas and Simitz. Arbitrary datum was used and referenced to temporary RM's at the site. Instrument W-90007 was used. A two-peg test was run on June 30, 1977; the instrument was found to be without error. Two-peg tests made July 12, 1977 show instrument still in adjustment.

DISCHARGE and gage height.--654 ft³/s (18.5 m³/s); gage height: 5.02 ft (highwater mark inside of well).

DRAINAGE AREA.--17.5 mi² (45.3 km²).

UNIT DISCHARGE.--37.4 ft³/s/mi² (0.409 m³/s/km²).

NATURE OF FLOOD.--This flood was caused by a heavy thunderstorm which apparently moved down the canyon, this action possibly causing an accentuation of the peak. Another factor which may have contributed to the size of this peak was the burning of approximately 40% of the forest cover of the watershed by the La Mesa fire which occurred about two weeks prior to this flood.

FIELD CONDITIONS.--The reach is in a large left bend and is generally expanding. It is in an area of fairly heavy brush and forest cover. The thalweg is in the center of the channel at sections 1 and 2 but moves toward the right bank at sections 3-5; a left bank overflow channel appears in section 3 and continues through section 5.

FIELD CONTITIONS CONTINUED.--

The main channel (thalweg) is about 5 ft wide and is basically trapezoidal. The width of the flood channel at this stage ranges from 51 ft at section 1 to 69 ft at section 5. The right bank is sloping earth, with a heavy cover of trees, bushes and grass. The left bank is composed of earth; it is sloping on the far left and gently sloping to flat in the flood plain area. There is an overflow channel that cuts into the flood plain in sections 4 and 5; it is U-shaped and is about 2 ft deep and 3 ft wide. The left bank has a heavy cover of trees, bushes and grass.

The roughness coefficients were selected in the field by R. P. Thomas; they are:

<u>Section</u>	<u>"n"</u>
1	0.065
2	0.068
3a	0.070
3b	0.060
4a	0.070
4b	0.080
4c	0.055
5a	0.070
5b	0.080
5c	0.060

COMPUTATIONS.--Discharges were obtained using a programmed HP-97 calculator.

<u>Section</u>	<u>Area(ft²)</u>	<u>α</u>	<u>Δh(ft)</u>	<u>L(ft)</u>	<u>Q(ft³/s)</u>
1	107	1.00			
2	113	1.00			
3	150	1.03			
4	152	1.16			
5	177	1.13			
1-2	(expanding)		0.63	48	457
2-3	(expanding)		0.74	62	582
3-4	(contracting)		1.28	54	944
4-5	(expanding)		0.72	62	764
1-5			3.37	226	654

COMPUTATIONS CONTINUED.--

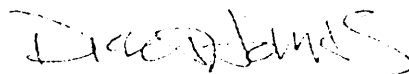
Final discharge was computed using all five sections:

$$Q = 654 \text{ ft}^3/\text{s}$$

<u>Section</u>	<u>EF</u>	<u>V(ft/s)</u>	<u>h_v(ft)</u>
1	0.74	6.11	0.58
2	0.70	5.79	0.52
3	0.49	3.81	0.30
4	0.45	3.84	0.33
5	0.35	2.78	0.24

EVALUATION.--Use $654 \text{ ft}^3/\text{s}$ and consider it of fair reliability. The highwater marks are generally excellent, the profile is fairly well defined but the reach is expanding. The Froude numbers indicate tranquil flow throughout the reach. The "n" values were difficult to pick and may represent a large source of error in this measurement. There is about 100% difference between discharges in subreaches 1-2 and 3-4 (maximum spread).

PREVIOUS COMPUTATIONS.--None.



Dick Thomas

Aug. 22, 1977

08313350 Rito de los Frijoles in Bandelier National Monument,
NM

RIO GRANDE BASIN

Part 8 - 1977

Regular Station

Flood of July 27, 1977

Indirect Measurement
3-Section Slope-Area

Discharge 397 ft³/s

Gage height: 3.88 (recorded peak)
3.88 (highwater mark inside of
well)

by

New Mexico District

Water Resources Division, U.S. Geological Survey

Santa Fe, New Mexico

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MEMORANDUM OF REVIEW

08313350 Rito de los Frijoles in Bandelier National Monument

Flood of July 27, 1977

A peak discharge of $397 \text{ ft}^3/\text{s}$ was obtained by using a 3-section slope-area reach about $3/4$ mile below gage.

Standard procedures were followed in obtaining and recording data in the field and in preparing data for computer.

The analysis by Mr. Thomas covers all the important details.

Use $397 \text{ ft}^3/\text{s}$ as peak discharge and consider it as no better than fair. The high-water profiles are rough because of local conditions and roughness coefficients were difficult to determine. The peak gage height was affected by backwater from debris but flume was not choked as much as for flood of July 5, 1977.

The reviewer has not seen site.

L. J. REILAND
District Reviewer

08313350 Rito de los Frijoles in Bandelier National Monument,
NM

RIO GRANDE BASIN

Part 8 - 1977

Regular Station

Flood of July 27, 1977

TYPE OF MEASUREMENT.--3-Section Slope-Area.

LOCATION OF SITE.--The slope-area site is about 3/4 mile downstream of the gaging station. The site is in a straight section of channel adjacent to the Monument Headquarters parking lot; it's just upstream of a foot bridge.

SURVEY OF SITE.--The site was selected and highwater profiles were surveyed on July 29, 1977 by R. P. Thomas and J. Simitz. Cross-sections were surveyed on August 3, 1977 by R. P. Thomas and K. Newton. Arbitrary datum was used and referenced to temporary RM's at the site. Instrument W-90007 was used; the instrument was checked by a two-pen test on June 30, 1977 and found to be without error.

DISCHARGE AND GAGE HEIGHT.--397 ft³/s (11.2 m³/s); gage height: 3.88 ft, recorded peak; 3.88 ft, highwater mark inside of well.

DRAINAGE AREA.--17.5 mi² (45.3 km²).

UNIT DISCHARGE.--22.7 ft³/s/mi² (0.248 m³/s/km²).

NATURE OF FLOOD.--This flood was caused by a heavy thunderstorm over the drainage area. Peak and volume of flow were possibly augmented by reduced vegetation on approximately 40% of the drainage area. The La Me: fire of June 1977 burned about 40% of the watershed.

FIELD CONDITIONS.--The reach is just downstream of a sharp right band; highwater marks are somewhat elevated on the left bank downstream of the bend and for about 60 ft upstream of the reach. Flow is contained in a straight trapezoidal section of channel; the bottom is about 7 ft wide, composed of gravel, cobbles and rocks. The banks are steeply sloping earth and have a fairly dense tree and brush cover in the upper portions. There are large trees and root systems which added to the roughness of the channel.

FIELD CONDITIONS CONTINUED.--

The roughness coefficients were selected in the field by R. P. Thomas.

<u>Section</u>	<u>"n"</u>
1	0.050
2	0.055
3	0.055

Stereo slides are available.

COMPUTATIONS.--Discharges were obtained using a programmed HP-97 calculator.

<u>Section</u>	<u>Area (ft²)</u>	<u>α</u>	<u>Δh(ft)</u>	<u>L(ft)</u>	<u>Q(ft³)</u>
1	63.1	1.00			
2	57.8	1.00			
3	45.1	1.00			
1-2	(contracting)		0.58	24	404
2-3	(contracting)		1.13	23	393
1-3			1.71	47	<u>397</u>

Final discharge was obtained using all three sections:

$$Q = 397 \text{ ft}^3/\text{s}$$

<u>Section</u>	<u>FF</u>	<u>V(ft/s)</u>	<u>hv(ft)</u>
1	0.72	6.29	0.62
2	0.77	6.87	0.73
3	0.97	8.80	1.20

EVALUATION.--Use 397 ft³/s and consider it of fair reliability. The highwater marks were generally good debris and the profiles are fairly well defined. The placement of cross-sections was limited somewhat by trees and heavy vegetation. The Froude numbers indicate tranquil flow in sections 1 and 2; Froude number of 0.97 at section 3 indicates flow near that section may be at or near transition. There is only a 3% difference between discharges in the two subreaches.

PREVIOUS COMPUTATIONS.--

<u>Date of flow</u>	<u>GHT(ft)</u>	<u>Q(ft³/s)</u>	<u>Type</u>	<u>Evaluation</u>
July 5, 1977	5.02	654	5-sec S-A	Fair

REMARKS.--This measurement and the July 5th measurement are plotted on a rating curve for the station; the curve appears reasonable, although there is a big difference, in discharge, between these measurements and the highest current meter measurements.

Dick Thomas

Dick Thomas

Aug. 22, 1977